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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/753,662 | 01/04/2001 | Shigeto Fujimura | 1592-0131P | 1881 |

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| EXAMINER |
|---|
| ANDERSON, MATTHEW A |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1765 | 14 |

DATE MAILED: 08/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/753,662 | FUJIMURA ET AL. | |
| | Examiner | Art Unit | |
| | Matthew A. Anderson | 1765 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *26 June 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) *5-10 and 12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 January 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 1-3, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda et al. (US 5,554,219) in view of Dutta et al. (US 6,273,969 B1).

Fukuda et al. discloses a process for the production of bulk single crystal ZnSe (zinc selenide). Zn Se is disclosed in the first sentence of col. 1 as a known semiconductor used in, for example, lasers. The background in the same column stresses the need to avoid twinned (i.e. poly-crystal) growth during the production of bulk monocrystals of ZnSe. In lines 18-29 and 44-57 is delineated the process. A VF (vertical Bridgeman as in the claims) or a VGF (vertical gradient freezing) furnace was used. A crucible was used to contain the melt within the vertical furnace. The raw material was melted and then a portion at the lower tip of the crucible was solidified by cooling. The crystal growth was then stopped. Then part of the resultant poly-crystalline ZnSe in the crucible tip was remelted. Then, from the lower surface of the melt in contact with the

remaining solid raw material, crystallization was resumed by cooling the melt by moving the crucible down at a certain rate. The result was twin-free bulk ZnSe. The examiner notes that nuclei are the art accepted points at which crystal growth is initiated.

Fukuda et al. does not explicitly disclose the nucleation as promoted by the solid raw material or the use of an encapsulant.

Dutta et al. discloses the method for making alloys of semiconductors including ZnTe, ZnSe, CdTe, CdSe (col. 4 lines 49-56) by VF methods including the use of an encapsulant including boric oxide ($B_2O_3$). The encapsulant prevents the vaporization of a volatile component of the melt.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the references because thereby the growth using a VF method would produce an semiconductor alloy of constant stoichiometry due to the prevention of vaporization.

It would have been obvious to one of ordinary skill in the art at the time of the present invention that, in a crucible existing in a vertical furnace in which a raw material had been melted and in which existed a solid portion of raw material, crystal growth of a compound semiconductor single crystal would have occurred because such is described by Fukuda et al.

It would have been further obvious to one of ordinary skill in the art at the time of the present invention that the crystal growth occurred from nuclei existing at the surface of the solid raw material adjacent to the raw material melt because

such growth occurred in Fukuda et al. and would have been consistent with the art accepted 'nucleation –growth' hypothesis of crystal growth.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to use $B_2O_3$ as the encapsulant for a ZnTe or CdTe VF crystal growth method because such is suggested by Dutta et al. Dutta et al. discloses that VF methods are interchangeable for growing ZnSe, ZnTe, and CdTe.

3. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda et al. and Dutta et al. as applied to claims 1-3, 11 above, and further in view of Taniguchi et al. (US 5,603,763).

The combination is described above.

The combination does not disclose nucleation on the top surface of the melt.

Taniguchi et al. discloses the formation of CdTe by a VF method of crystal growth. In col. 12 15-30 it is disclosed that the nuclei are formed only on top f the melt away from the crucible wall and thus single crystals are easily obtained. Taniguchi et al. uses a controlled atmosphere (Cd vapor) to control surface volatilization of Cd.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the methods above because the atmosphere controlled method represented by Fukuda et al. and Dutta et al. is then protected

from polycrystal (i.e. twin) formations. The substitution of one way of atmosphere control for another would have been obvious to one of ordinary skill.

***Election/Restrictions***

4. Newly submitted claims 5-10, 12 directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

The above claims are differently classified than the originally received claim 1 (process),

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 5-10, 12 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

***Response to Arguments***

Applicant's arguments with respect to claim have been considered but are moot in view of the new ground(s) of rejection.

The argument that Fukuda et al. fails to show growth of a crystal from a single nucleus is not convincing. In the Abstract Fukuda et al. describes *a* single crystal

grown on the polycrystal. The growth of a single crystal must come from a single nucleus or else polycrystals would occur.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (703) 308-0086. The examiner can normally be reached on M-Th, 6:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

ROBERT KUNEMUND
PRIMARY EXAMINER

MAA
August 20, 2002